

WHAT IS CLAIMED IS:

1. A control apparatus for numerical control adapted for a cutting machine having a turret which can be turned to an arbitrary position, wherein

an X-axis offset value (ΔX) and a Z-axis offset value (ΔZ) of a cutting edge of a cutting tool on coordinates with respect to said cutting machine are calculated in accordance with a turning angle of said turret, and

said X-axis offset value and said Z-axis offset value are indicated on a display.

2. A control apparatus according to claim 1, wherein an X-axis wear compensation value (ΔX_t) and a Z-axis wear compensation value (ΔZ_t) are indicated in relation to said X-axis offset value (ΔX) and said Z-axis offset value (ΔZ).

3. A control apparatus according to claim 1, wherein when said turret is turned to a turning angle (α), an X-axis value of the tool (L_2), a Z-axis value of the tool (L_1), an X-axis value of the turret (L_4) and a Z-axis value of the turret (L_3) are converted according to the following equations to calculate said X-axis offset value (ΔX) and said Z-axis offset value (Δ

Z) .

$$\Delta X = (\Delta Az \cdot \cos \alpha - \Delta Ax \cdot \sin \alpha) \times 2 \quad (\text{Equation 1})$$

$$\Delta Ax = L2 + L4$$

$$\Delta Az = L1 + L3$$

$$\Delta Z = -\Delta Az \cdot \sin \alpha - \Delta Ax \cdot \cos \alpha \quad (\text{Equation 2})$$

4. A control apparatus according to claim 2, wherein when said turret is turned to a turning angle (α), an X-axis value of the tool (L2), a Z-axis value of the tool (L1), an X-axis value of the turret (L4) and a Z-axis value of the turret (L3) are converted according to the following equations to calculate said X-axis offset value (ΔX) and said Z-axis offset value (ΔZ).

$$\Delta X = (\Delta Az \cdot \cos \alpha - \Delta Ax \cdot \sin \alpha) \times 2 \quad (\text{Equation 1})$$

$$\Delta Ax = L2 + L4$$

$$\Delta Az = L1 + L3$$

$$\Delta Z = -\Delta Az \cdot \sin \alpha - \Delta Ax \cdot \cos \alpha \quad (\text{Equation 2})$$

5. A control apparatus according to any one of claims 1 through 4, wherein said cutting tool can be rotated around the tool axis to an arbitrary position,

an X-axis value (L2r) of said cutting edge of said cutting tool after a rotation of said cutting tool with a rotation angle (β) is calculated according to the

equation of $L2r = L2 \cdot \cos \beta$,

said X-axis offset value and said Z-axis offset value when said turret is turned to a turning angle (α) are calculated according to the following equations 3 and 4, and

said X-axis offset value (ΔXr) after the rotation of said cutting tool and said Z-axis offset value (ΔZr) after the rotation of said cutting tool are indicated on said display.

$$\Delta Xr = (\Delta Az \cdot \cos \alpha - \Delta Axr \cdot \sin \alpha) \times 2 \quad (\text{Equation 3})$$

$$\Delta Axr = L2 + L4$$

$$\Delta Az = L1 + L3$$

$$\Delta Zr = -\Delta Az \cdot \sin \alpha - \Delta Axr \cdot \cos \alpha \quad (\text{Equation 4})$$

6. A method of indicating an X-axis offset value (ΔX) and a Z-axis offset value (ΔZ) of a cutting edge of a cutting tool, in a control apparatus for a cutting machine having a turret which can be turned to an arbitrary position, said method comprising the steps of:

reading an X-axis value of the tool ($L2$) and a Z-axis value of the tool ($L1$) of the selected cutting tool;

reading an X-axis value of the turret ($L4$);

storing a Z-axis value of the turret ($L3$) in

memory;

reading a turning angle (α) of said turret;

calculating said X-axis offset value (ΔX) and said Z-axis offset value (ΔZ) according to the following equations 1 and 2, employing said X-axis value of the tool (L2), said Z-axis value of the tool (L1), said X-axis value of the turret (L4) and said Z-axis value of the turret (L3); and

indicating said X-axis offset value (ΔX) and said Z-axis offset value (ΔZ).

$$\Delta X = (\Delta A_z \cdot \cos \alpha - \Delta A_x \cdot \sin \alpha) \times 2 \quad (\text{Equation 1})$$

$$\Delta A_x = L2 + L4$$

$$\Delta A_z = L1 + L3$$

$$\Delta Z = -\Delta A_z \cdot \sin \alpha - \Delta A_x \cdot \cos \alpha \quad (\text{Equation 2})$$

7. A control apparatus for numerical control adapted for a cutting machine in which a cutting tool is rotated around the tool axis thereof to an arbitrary position, wherein an X-axis value (L2r) of a cutting edge of said cutting tool on a coordinate with respect to said cutting machine is calculated in accordance with a rotation angle of said cutting tool,

an X-axis offset value (ΔX_r) after the rotation is obtained from the following equations employing said X-axis value of the tool (L2r) and an X-axis value of

the turret (L4), and

said X-axis offset value (ΔX_r) after the rotation is indicated on a display.

$$\Delta X_r = \Delta A_{xr} \times 2$$

$$\Delta A_{xr} = L_{2r} + L_4$$

8. A control apparatus for numerical control adapted for a cutting machine in which a cutting tool is rotated around the tool axis to an arbitrary position, wherein a Y-axis offset value (ΔY) of a cutting edge of said cutting tool on a coordinate with respect to said cutting machine is calculated in accordance with a rotation angle of said cutting tool, and said Y-axis offset value is indicated on a display.

9. A control apparatus according to claim 7 or 8, wherein a Y-axis offset value (ΔY) of said cutting edge of said cutting tool on coordinates with respect to said cutting machine is calculated in accordance with the rotation angle of said cutting tool, and

an X-axis wear compensation value (ΔX_t) and a Y-axis wear compensation value (ΔY_t) are indicated in relation to said X-axis offset value (ΔX_r) after the rotation and said Y-axis offset value (ΔY).